Medium-energy heavy-ion single-event-burnout imaging of power MOSFET'S

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IEEE TRANSACTIONS ON NUCLEAR SCIENCE 46 (1999) 1415-1420

We present the first experimental determination of the SEB sensitive area in a power MOSFET irradiated with a high-LET heavy-ion microbeam. We used a spectroscopy technique to perform coincident measurements of the charge collected in both source and drain junctions together, with a non-destructive technique (current limitation). The resulting charge collection images are related to the physical structure of the individual cells. These experimental data reveal the complex 3-dimensional behaviour of a real structure, which can not easily be simulated using available tools. As the drain voltage is increased, the onset of burnout is reached, characterized by a sudden change in the charge collection image. "Hot spots" are observed where the collected charge reaches its maximum value. Those spots, due to burnout triggering events, correspond to areas where the silicon is degraded through thermal effects along a single ion track. This direct observation of SEB sensitive areas as applications for, either device hardening, by modifying doping profiles or layout of the cells, or for code calibration and device simulation.